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IDEOLOGY AND PRACTICE OF PLANNING FUNDAMENTAL RESEARCH IN THE USSR (1920–1930)

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Abstract. Analysis of government regulation in the academic sphere during the USSR period is a highly relevant research area. Such studies are instrumental in elucidating both the positive and negative aspects of the Soviet scientific model. In this study, the author sets out to identify the main patterns of the transition towards directive planning of academic science in the RSFSR/USSR in the 1920s-1930s. In the context of such transformation of Soviet academic science, it is important to consider not only the institutional decisions of the authorities but also the underpinning socio-psychological and ideological motives. These factors significantly influenced the functioning of the scientific community. An interdisciplinary approach was used to achieve the research objectives. The study lies at the intersection of several related research areas: the history of science, science studies, and the history of economics. The research methodology employed comparative-historical, historical-cultural, and statistical methods to identify significant patterns of the phenomenon under investigation. Methodologically, this approach aligns closely with source studies and semiotic analysis. Such concepts as 'scientist', 'thematic plan', 'thematic development', and 'research plant' emerged and became institutionalised within the paradigm of directive planning of basic science. These concepts form a contextual layer of understanding. The ideologists of this system conceived the planning of basic science as a product of the industrial world. However, paradoxically, the ideology and methodology of directive planning, when imposed on theoretical science, yielded the opposite results. These included epistemological apathy among scientists and the reduction, if not extinction, of vast areas of research activity. The attempt of the government to adapt basic science to addressing strictly applied problems of industrialisation ultimately resulted in a mere semblance of 'planned science'. Nevertheless, the internal compensation mechanisms of self-organisation within the scientific community proved to be quite effective in the long run, even under the constraints of directive planning. The historical analysis conducted allowed the author to draw significant conclusions relevant to the formation of Russian scientific policy at its present stage.

Keywords: directive planning, planning of scientific research, Academy of Sciences, pure science, scientific researchers, scientific personnel

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ИСТОРИЯ НАУКИ

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ИДЕОЛОГИЯ И ПРАКТИКА ПЛАНИРОВАНИЯ ФУНДАМЕНТАЛЬНЫХ ИССЛЕДОВАНИЙ В СССР (1920–1930)

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Аннотация. Анализ опыта государственного регулирования научной сферы в СССР является актуальным направлением исследований, позволяющим выделить положительные и отрицательные стороны советской модели функционирования науки. Цель статьи – выявить основные закономерности процесса перехода к директивному планированию академической науки в РСФСР/СССР в 1920-е-1930-е. В контексте этой трансформации советской академической науки важно рассмотреть не только определяющие институциональные решения политической и государственной власти, но и социально-психологические, а также идеологические мотивы, обусловившие эту, важную для функционирования науки, трансформацию. Такая постановка проблемы требует междисциплинарного методологического подхода к ее рассмотрению. Статья находится на стыке нескольких родственных направлений исследования: истории науки, науковедения, истории экономики. В работе использовались сравнительно-исторический, историко-культурный и статистический методы для выявления значимых закономерностей изучаемого феномена. Методически, это близко к источниковедению, семиотическому анализу. Понятия, сформированные и институцианализированные в парадигме директивного планирования фундаментальной науки, – «научный работник», «тематический план», «тематическая разработка», «научно-исследовательский комбинат», – формируют контекстный пласт. Планирование фундаментальной науки мыслилось ее идеологами как закономерный продукт индустриального мира. Но, парадоксальным образом, насаждаемая в теоретическую науку идеология и методология директивного планирования дала обратные результаты – эпистемологическую апатию ученых, сокращение, если не сказать – вымирание, огромных областей исследовательской деятельности. Само государство, в своем стремлении адаптировать чистую науку к решению сугубо прикладных проблем индустриализации, в итоге получило фактически симулякр «плановой науки». Однако, внутренние компенсационные механизмы самоорганизации научного сообщества оказались вполне эффективны на относительно большом масштабе времени даже в условиях «директивного планирования». Проведенный исторический анализ позволяет сделать значимые выводы в контексте формирования российской научной политики на современном этапе.

Ключевые слова: директивное планирование, Академия наук, планирование научных исследований, чистая наука, научные работники

Информация о финансировании: Данное исследование выполнено без внешнего финансирования.

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INTRODUCTION

Science, existing and evolving within and alongside society, requires additional degrees of freedom. Its 'turbulence' – which, however, does not exclude the internal logic of the self-development of scientific knowledge – is a necessary condition for achieving significant fundamental results. The element of serendipity is an inherent attribute of scientific progress. In this context, it is interesting to examine how, in the USSR during the 1920s and 1930s, attempts were made to impose strict control over the 'spontaneous' development of scientific research and what outcomes this produced by the 1940s.

From the late 1920s onwards, the political and state authorities in the USSR used *directive (centralised) planning of scientific research* as a tool to control fundamental (academic) science. The key factor in this process was the imperative demand for total ideological homogeneity.

In this study, I aim to identify the key principles behind the transition towards mandatory planning of academic research in the RSFSR and the USSR during the 1920s and 1930s. While examining these transformations in Soviet academic science, I will explore not only the main institutional decisions made by the political and state leadership but also the socio-psychological and ideological factors that either triggered or resulted from these changes. These factors shaped the functioning of science for many years to come.

This study lies at the intersection of several related fields: the history of science, science studies, and economic history. The study employs comparative-historical, cultural-historical, and statistical approaches to identify the key principles of the phenomenon under investigation.

PLANNED TELEOLOGY

V.I. Vernadsky, a member of the Central Committee of the Constitutional Democratic Party and an academician of the Imperial Academy of Sciences in St. Petersburg, was scheduled

to deliver a speech at a 'scientific institute' in Moscow on 19 February 1917, just before the February Bourgeois Revolution in Russia. Due to 'unforeseen circumstances,' the speech did not take place, but it was later published in newspapers. Here is an excerpt therefrom:

'The state must provide resources, establish scientific organisations, and set tasks for us. However, we must always remember and understand that its involvement in scientific creative work cannot go beyond this. Science, like religion, philosophy, or art, represents a spiritual domain of human creativity. It is more powerful, profound, and eternal than any social forms of human life. It is self-sufficient, free, and tolerates no constraints.

This must not be forgotten. If Russian society can direct state resources towards broad scientific work in these areas of scientific inquiry, the organisation of scientific work must be left to the free scientific creativity of Russian scientists. It cannot and should not be regulated by the state. It does not conform to bureaucratic frameworks' (Vernadsky, 2013a, p. 250).

In my view, this passage captures most concisely the self-perception of the majority of representatives of 'pure science' in Russia at that time. These individuals were primarily members of the Imperial St. Petersburg Academy of Sciences. By early 1917, the Imperial Academy of Sciences had included 44 full members. By 1918, it had featured 20 academic institutions and 22 academic commissions (Samarin, 2023, p. 240).

This position was not expressed by a mere commentator but by a renowned scientist, academician, and prominent member of a political party – the Constitutional Democrats (Kadets) – that would soon come to power in Russia following the abdication of Nicholas II.

The leaders and ideologists of the Soviet state held a radically different view of the role, place, and functions of science in general, and pure science in particular. The term 'pure science,' familiar to academicians, quickly acquired a negative connotation after the revolution. For example, in October 1924, G.L. Pyatakov, Deputy Chairman of the Supreme Council of the National Economy (VSNKh), wrote to members of the board of the Scientific-Technical Department of the VSNKh, V.N. Ipatiev, L.K. Martens, and N.M. Fedorovsky, insisting: 'Let pure science find its place in other institutions and institutes. We need applied science that directly contributes to the improvement and development of production' (as cited in Strekopytov, 1990, p. 16).

It is worth noting that when organising the Scientific-Technical Department (NTO) of the VSNKh in the summer of 1918, the draft regulations for this new scientific-technical body were submitted for review to the Russian Academy of Sciences. The decree establishing the NTO stated: *'To centralise all scientific, technical, and experimental work in the RSFSR, to bring science and technology closer to production practice*, to distribute specific tasks arising from the needs of the national economy among scientific and technical institutions, societies, laboratories, institutes, experimental stations, etc., and to monitor the fulfilment of these tasks, the Council of People's Commissars resolves to establish a Scientific-Technical Department under the VSNKh' (italics added by the author's unless otherwise indicated) (as cited in Lakhtin, 1990, p. 20). A special commission of the Russian Academy of Sciences reviewed the draft on 21 July 1918. While the document was generally approved, the commission expressed a wish: the newly established NTO should operate in a way that prevents 'excessive interference in creative scientific work.'

In 1918, A. Bogdanov, head of Proletkul't[1], insisted that the working class faced the task of 'reworking modern science in form and content from a collective labour perspective and transmitting it in a transformed state to the working masses' (Bogdanov, 1918). From approximately 1918 to 1925, the authorities in the RSFSR/USSR wavered in their search for a balance

[1] Proletkul't, short for 'Proletarian Culture,' was a Soviet cultural movement that emerged after the 1917 Revolution. It aimed to create a distinct proletarian culture, separate from bourgeois traditions, by promoting art, literature, and education rooted in working-class values and collective labour. The movement sought to empower the working class by reshaping cultural and intellectual life in line with socialist ideals (*Proletkul't,* n.d.).

between applied and pure science. Ultimately, the 'party' advocating strict centralisation and directive planning of all science prevailed. The balance between the institutions of the NTO (by then reorganised into the Scientific-Technical Administration, NTU) and the USSR Academy of Sciences was disrupted. "In 1926–1929, the NTU and its institutions grew into the largest scientific complex in the country. Speaking at the V Congress of Soviets of the USSR in May 1929, M.N. Pokrovsky remarked: "The VSNKh has built something more powerful than the Academy of Sciences" (as cited in Strekopytov, 1990, p. 20).

For the Bolsheviks, science had to become, above all, a 'fuel' or expendable resource for solving practical economic problems. It needed to be practice-oriented, and this practice had to be thoroughly ideologised. 'The principle of party-mindedness determines the planned development of sciences and their most important directions,' retrospectively noted S.I. Vavilov, a truly high-calibre physicist and President of the USSR Academy of Sciences (1945–1951) (Vavilov, 1950, p. 19). Similarly, N.I. Bukharin, a leading party theorist and member of the Politburo of the Central Committee of the All-Union Communist Party (Bolsheviks), insisted in one of his programmatic articles in 1927: "The socio-political root of scientific theories, which becomes quite tangible with more or less planned organisation of scientific work, eradicates the remnants of idealism... <...> A 'planned economy' in the field of science will inevitably be accompanied by an increasingly rapid growth in the productivity of scientific labour" (Bukharin, 1989a, pp. 54–55).

The renowned Soviet linguist and Slavist, corresponding member of the Russian Academy of Sciences, A.M. Selishchev, meticulously tracked changes in the structure, corpus, and rhetoric of the Russian language after the revolution in the 1920s. In 1928, he published a work containing an intriguing observation: "For communist activists, *economics* represents one of the most essential tasks in the practice of social life," wrote Selishchev. "People frequently speak and write about the country's economy. Numerous *plans* and *planning bodies*, *planning commissions* with the central institution of *Gosplan*[2], their participants – *planners*, and the striving for *planned work* – all aim to improve the conditions of economic life. For the same purpose, institutions and organisations draw up plans for their activities over a specific period – *calendar plans*, *work schedules*. *Conjunctural congresses* discuss economic issues and draft *long-term plans*. *Disorganised* and scattered work is contrasted with purposefully distributed work. <...> *'Plan-making'* is one of the most persistent Soviet ailments that the USSR has suffered from for nine years" (italics in the text) (Selishchev, 2003, pp. 142–143).

These purely philological observations can now be supported by statistical data. The computer program for frequency analysis of texts, *Books Ngram Viewer*, developed by researchers from Harvard University and the Massachusetts Institute of Technology (Cambridge, USA) (Michel, Yuan, Aiden et al., 2011), can be used to trace how the frequency of certain words, concepts, and terms has changed over time. As shown in *Figure 1*, the frequency of the term 'science planning' in Russian-language texts from 1900 to 2000 reveals significant trends. In this case, we are interested not so much in the absolute figures (although they are also relevant) as in the shape of the distribution itself.

This graph, generated using the Books Ngram Viewer software in response to the query 'science planning,' illustrates conspicuously that science planning was considered a crucial element of the USSR's economic development for almost the entire duration of its existence. The only exceptions were the period of the Second World War and a brief interregnum following the death of Joseph Stalin. Notably, the peaks of interest in science planning almost perfectly coincide with major campaigns: first industrialisation, then post-war economic recovery, and

[2] Gosplan, short for Gosudarstvennyy Planovyy Komitet (State Planning Committee), was the central agency responsible for economic planning in the Soviet Union. Established in 1921, it played a key role in creating and implementing the Five-Year Plans, which aimed to industrialise and manage the Soviet economy. Gosplan coordinated production targets, resource allocation, and economic development across the USSR, reflecting the state's emphasis on centralised, planned economic management (Kazansky, 2023).

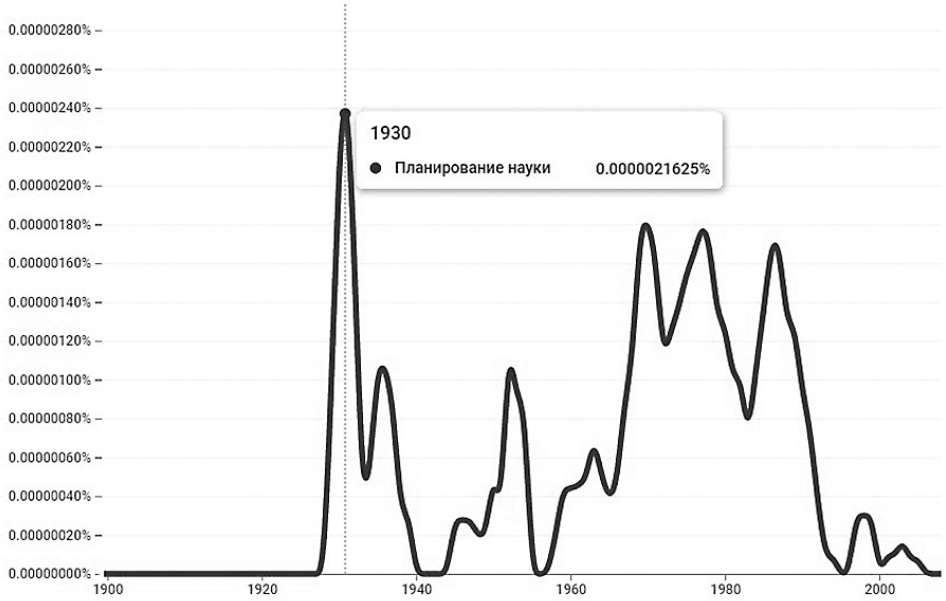

Figure 1. Frequency of appearance of the term 'science planning' in the Russian-language texts: 1900–2000. The sample size is 20,120,701 texts.
Рисунок 1. Частота появления термина «планирование науки» в русскоязычных текстах: 1900–2000 гг. Объем выборки – 20.120.701 русскоязычных текстов.

finally, several unsuccessful attempts to modernise the Soviet economy in the 1960s-1980s.

Soviet-American philosopher B. Paramonov described the essence of that era as follows: "This is collective labour teleology: the ancient understanding of purpose as a 'final cause' acquires a new, fresh meaning. The work plan becomes the cause of activity. In other words, 'being' becomes equivalent to 'action.' This is the myth of 'created reality,' the myth as an apology for total human activity – taking the form of a technological utopia. <...> The logic of technological expansion as the main content of the current era is not just brilliantly expressed by Bogdanov – it is expressed correctly. If he <...> failed to foresee the ominous consequences of the era, it is because he stood at its origins, not at the epicentre of the storms it unleashed" (Paramonov, 2001, p. 263).

Indeed, the pragmatism behind the statements of Alexander Bogdanov, Nikolai Bukharin, and many other proletarian theorists is clear – industrialisation. But why did this pragmatism take such absolutised forms? Clearly, it was not just a matter of techno-rationality rooted in the mega-ideology of Marxism-Leninism. There was also an ontological factor at play, a metaphysics of this pragmatism, if you will.

The idea of planning, of taming space and time, perfectly aligned with the highly specific collective psychotype of power that had formed in the USSR. The renowned Soviet biologist Professor B.M. Zavadovsky articulated this idea in 1927: 'The primary motive behind all scientific attempts to experimentally approach natural phenomena is the desire to *take nature into our hands, to subject its laws to planned principles and human guidance*' (Zavadovsky, 1927, p. 118). In other words, all of Nature had to be subjected to planning.

Hence, the idea of planning extended to science as well. This idea shaped the institutional framework of Soviet academic science. The adaptation and subordination of scientific research to the realities of production led to the demand for science planning. Indeed, if production was to be planned – a requirement seen as natural and reasonable – then science, which served production, had to be planned too. From the late 1920s onwards, *directive planning of*

scientific research became the tool for political and state control over fundamental and, in particular, academic science in the USSR.

Russian historian of science G.P. Aksenov noted: '1927 marked a turning point in planning. Before that, the USSR Academy of Sciences was required to submit its annual plan to the State Planning Commission. However, the growing number of research institutes fundamentally changed this arrangement' (Aksenov, 1999, p. 214). Gosplan now had to oversee scientific work plans to prevent topic duplication and trivial research.

A decree by the Council of People's Commissars of the RSFSR on 20 January 1927 stated: 'Scientific research must be closely aligned with the needs of socialist construction and, in particular, the national economy' (cited in Samarin, 2023). This was a logical measure, given that the implementation of planning in academic research was progressing poorly. Deputy People's Commissar of Education Professor M.N. Pokrovsky, speaking at the 15th Congress of the All-Union Communist Party (Bolsheviks) on 15 December 1927, did not hide his frustration: 'You may encounter major scientific institutions that, instead of a plan, naively present you with a half-page list of current issues they are working on... As for a plan for the scientific activity of the entire country... we don't even have the materials to construct one yet' (cited in Lakhtin, 1990, p. 136). It is no surprise that the USSR Academy of Sciences failed to develop a scientific work plan for the first five-year plan. The Academy's first plan in its 200-year history was only presented in 1931. Nevertheless, the Academy's priority later shifted to survival rather than 'bringing science and technology closer to production practice.'

The same M.N. Pokrovsky, director of the Institute of Red Professors and chairman of the Presidium of the Communist Academy, declared at the 4th Plenum of the Central Council of the Section of Scientific Workers on 17 May 1928: 'To me, the Academy of Sciences as a whole is an unjustified phenomenon in the conditions of the 20th century' (*Chronicle of the Russian Academy of Sciences*, 2007, p. 633). Thus, the introduction of planning into Soviet science led to a clash between two fundamental approaches, two views on the role of science in society, its development prospects, and the methods of influencing –ideally, controlling – this development.

CHAOS AND PLANNING

The psychology of the sincere advocates of 'planned science' is, of course, fascinating. For instance, Nikolai A. Voznesensky, a lecturer in political economy at the Institute of Red Professors, future chairman of Gosplan (considered the most effective in Soviet history), and an academician (elected in 1943), remarked in 1931: "Chaos cannot acquire the force of a developmental law under the conditions of victorious socialist construction" (Voznesensky, 2018, p. 66). In one of his first major theoretical articles, *On the Question of the Socialist Economy*, he elaborates:

'Expressing the absolute predominance of socialist production relations in the country, the socialist plan has evolved from a guiding principle to an overwhelmingly dominant force across the entire national economy. It encompasses every sector, not only in industry but also in agriculture, covering both the planning of material resources and the planned distribution of labour. Millions of workers and collective farmers are now involved in planning work. The struggle against chaos has reached a new stage... <...> The completion of the foundation of the socialist economy in the USSR has firmly established the plan as the overwhelmingly dominant *form of economic movement*' (italics in original) (Voznesensky, 1931, p. 45).

Here, Voznesensky describes 'national economic planning' as the absolute predetermination of outcomes, coupled with a metaphysical certainty that these outcomes already exist in nature.

Behind this rhetoric lies not just the construction of persuasive arguments but a profound, organic belief in the possibility of controlling historical processes and combating chaos. This mindset explains the intense, sometimes dramatic, debates around the theory of relativity

and the rejection of quantum interpretations of physical processes in the USSR during the 1920s and 1930s. These debates were driven by ideological rather than scientific considerations. As Nikolai Bukharin noted:

"...In physics, there is a fierce *assault on the ideas of determinism* and causality (the distinction between the laws of the macro- and microcosmos, the so-called 'mathematical' nature of the law, etc.); in general, there is a campaign to *discredit rational knowledge*, a heightened flirtation with the 'unconscious,' odes and hymns to the 'irrational,' 'intuition,' and, through these chants, a pilgrimage into the realm of mysticism, and so on and so forth" (italics in original) (Bukharin, 1989b, p. 74).

Thus, the Bolsheviks transferred their methods of political struggle to a struggle against the cosmos, which they saw as embodied in the capitalist economic system – or at least against what they perceived as an alien worldview. Academician Vladimir I. Vernadsky captured this sentiment in his diary on 12 February 1936:

"Yesterday, *Nature* arrived with Rutherford's article cut out – I must speak with Bauman and Krzhizhanovsky. This is madness and obscurantism" (Vernadsky, 2013c, p. 81)[3].

In this context, ideology was experienced as a technology, a method, and ultimately, the plan was seen as a universal tool for managing the economy, society, and even history itself.

EVERYTHING ACCORDING TO PLAN

In 1931, a pivotal event took place that shaped the development of 'planned science' in the USSR. From 6 to 11 April 1931, the First All-Union Conference on Planning Scientific Research was held in Moscow. "The conference went beyond mere planning. It aimed at something greater – the creation of a centralised system of scientific activity, planned and managed from above, based on national economic plans and interests. Science was understood solely as science serving production; fundamental research, whose results serve as starting points for new investigations, was dismissed in several reports as 'science for science's sake.' The primary task of science was defined as 'providing prompt scientific and technical assistance to production'" (Lakhtin, 1990, p. 139).

Nikolai I. Bukharin initiated and organised the conference. He delivered a comprehensive keynote speech, the main points of which included the following directives: 'Scientific research itself must be subject to planning'; 'The plan is the most powerful tool of proletarian class politics in the field of scientific research'; and 'The maximum alignment of theory with practice, with the primacy of practice and an emphasis on the utilitarian (do not shy away from this word) aspect of scientific research, must be our task' (Bukharin, 1989b, pp. 82, 89, 91).

The USSR Academy of Sciences' reaction to the conference's resolutions is telling. 'The General Meeting of the Academy of Sciences, following a report by Academician N.I. Bukharin on the outcomes of the Conference on Planning Scientific Work, adopted the following resolution: 1) to acknowledge the significant scientific, organisational, and socio-political importance of the Conference; 2) to recognise the need for the prompt establishment of a body for planning scientific work under Gosplan (the State Planning Committee) of the USSR; 3) to consider it necessary to convene a series of sectoral conferences to plan work in each branch of science; and 4) to approve the work of the Academy's delegation at the Conference' (Organizational and administrative chronicle, 1931, p. 51). On the one hand, the Academy cautiously endorsed the conference's decisions; on the other, it clearly sought to distance itself from specifics, reducing the resolutions to a formal, almost phantom, level disconnected from the realities of research.

Immediately after the conference, a series of sectoral meetings took place: 'The Conference on Planning Archaeological Work,' 'The Conference on Planning Research in Magnetism,' 'The Conference on Planning Research in Colloid Chemistry,' and 'The Conference on Planning Research in Metal Physics' (*SORENA*, 1931, 1932).

[3] This is according to V.I. Vernadsky. The reference is to Ernest Rutherford, the English scientist and father of nuclear physics, who experimentally discovered the atomic nucleus in 1911.

Academician Sergei I. Vavilov later wrote: 'The decisive transition to a planned system constitutes the most characteristic feature of Soviet science in the second period of its history, roughly coinciding with the second Soviet decade' (Vavilov, 1950, p. 53).

In line with these planning directives, not only did the structure of scientific management change, but so did the rhetoric of the state towards science. The conceptual framework of the state's scientific policy adapted to the new reality.

For example, the term 'scientist' transformed into 'scientific worker.' A revealing example comes from an article by Academician V.P. Volgin: 'Every *individual scientific worker* always has some kind of plan for their scientific work, whether well or poorly thought out. *The union of scientific workers into a collective* only makes sense if this collective has a *common work plan*. The debate here can only be about the methods of creating such a plan' (Volgin, 1931, p. 10).

'Scientific research' took the form of *'thematic development'*: 'a) *plans should present a coherent system of topics grouped around key problems*; b) plans should anticipate the emergence of new problems during the course of the work; c) *the thematic plans of the Academy's institutions should be based on the Academy's general plan...*' (Lakhtin, 1990, p. 138). '*The planning of topics* <...> includes the allocation of these topics among various research institutions' (Bukharin, 1989c, p. 96).

In the new planning lexicon, 'laboratory' and 'research collective' became 'scientific research complexes.' Academician Alexander E. Fersman asked: 'Shouldn't the largest institute with the leading industrial researchers have been placed at the centre of each of these giant construction projects?' (Fersman, 1931, p. 180). 'The complex will ensure that all production plans (for factories, technical schools, and institutes) are drawn up in such a way that they include... the acceleration of all relevant processes' (Tverdovsky, 1931, p. 126).

These changes in both form and substance of fundamental research inevitably affected the psychological climate within the academic community. On 10 February 1932, Academician Vladimir I. Vernadsky noted in his diary: 'At the library meeting – I didn't stay until the end – there was *a lot of talk and planning*, but the resources are pitiful' (Vernadsky, 2013b, p. 353). Six years later, the situation, in Vernadsky's view, had only worsened: 'The idea of the plan is mainly felt through its negative aspects. *The goal, not the plan, is pushed forward*, and there is a pervasive anxiety about the stability of what is being achieved. <...> It's bleak. The young people promoted in the Academy are below average. Constant arrests are disrupting life' (Vernadsky, 2013b, pp. 351–352).

Academician Pyotr L. Kapitsa offered a highly emotional assessment of the state of the Soviet academic community at the time. Despite its expressiveness, his perspective is credible, given his fresh viewpoint after more than a decade working at Cambridge. On 25 November 1935, in a letter to his wife in England, Kapitsa wrote: 'I gave a lecture in the evening, at 8 o'clock. The local professors were there. They were all sleepy, inert, sitting like statues. There is no enthusiasm for science here – I mean pure scientific enthusiasm. They are so downtrodden and hungry, so exhausted by hackwork. I have never seen such an inert audience' (cited in Dolgova, 2020, p. 331).

After returning to the USSR from Cambridge in 1934, Kapitsa was effectively instructed by the Politburo of the Communist Party and the Council of People's Commissars not to change his field of research[4]. He had intended to move into biophysics, focusing on 'the mechanics of muscle activity,' but the authorities insisted he continue his work on strong magnetic fields and low temperatures (Kapitsa, 1990, pp. 3–4). On 10 July 1935, Vernadsky wrote in his diary: '...the individual and their deepest interests are, as a rule, not taken into account in planning' (Vernadsky, 2013c, p. 41).

What did the implementation of the ideology of directive planning mean for Soviet science in practice? First and foremost, the stated goal – as formulated by Bukharin: "A 'planned economy'

[4] To be fair, it should be noted that for his work in the field of low-temperature physics, P.L. Kapitsa was awarded the Nobel Prize in 1978.

in science will inevitably lead to a rapid increase in the productivity of scientific labour"—was not achieved. According to calculations by economic historian G.I. Khanin and economic journalist V.I. Selyunin, 'the 1930s saw the greatest increase in material intensity and the sharpest decline in capital productivity in our history' (Selyunin, Khanin, 2020, p. 25).

The situation in fundamental science was no better. In a letter to Joseph Stalin on 14 March 1945, Kapitsa noted: 'We are not yet ready to tackle <...> major problems, or perhaps such things can only be achieved gradually, over decades, and history cannot be forced, no matter how much one might wish it. <...> It has been 27 years since the revolution. We have built much and mastered much, but how little of our own major contributions have we made to technology! Personally, I can name only one major achievement – synthetic rubber. This is indeed a world-class achievement; initially, we were ahead, but unfortunately, today both America and Germany have surpassed us. Yet how little we ourselves have felt or feel the significance of this major accomplishment!' (Kapitsa, 1990, p. 22).

The search for a balance between theoretical ('pure') and applied science remained an ontological 'pain point' for a science governed by directive planning.

CONCLUSION

In early 1984, under the auspices of the USSR Academy of Sciences, a *Comprehensive Programme for Scientific and Technological Progress of the USSR for 1986–2005* was prepared. This document outlined areas of scientific research where the country lagged behind global standards. "First and foremost, it is necessary to highlight areas such as the development of supercomputers; powerful proton accelerators, meson factories, high-intensity electron accelerators for high and medium energies; scientific instrumentation; certain areas of electronics and solid-state physics; energy research, particularly the production of synthetic liquid fuel from coal and the development of super-powerful coal-fired boilers; chemistry, especially fine organic synthesis (small-scale chemistry), catalysis, high-strength and high-modulus polymer materials, and the development of various types of adsorbents and analytical chemistry; life sciences, particularly immunology, enzymology, and certain areas of genetics and breeding; and research related to ecology and the sustainable use of biological resources" (*23. Complex Program of Scientific and Technical Progress of the USSR for 1986–2005 (for five years)*, 1983, p. 9). As a result, by 1986, out of 220,000 machine tools produced annually in the USSR, only 4,000 were automated (Mitrokhin, 2023, p. 147).

An interesting diary entry is cited in the memoirs of Anatoly S. Chernyaev, an aide to the General Secretary of the CPSU Central Committee. According to this account, as early as 1972, General Secretary Leonid I. Brezhnev was forced to admit: 'We do not have Gosplan as an organisation that determines strategic perspectives and strictly controls the progress of our economy' (Chernyaev, 2008, p. 33).

However, it is worth noting that most of the areas where the USSR lagged behind were in applied science, even industrial science. Paradoxically, the situation in pure, fundamental science was somewhat different. This is evidenced, at least in part, by the list of domestic Nobel laureates (from 1917 to 2023, 14 individuals were awarded the Nobel Prize in Physics and Chemistry). Even Soviet and post-Soviet scientists (including those who later changed citizenship) conducted their Nobel-winning research while working in the USSR or later in the Russian Federation. For example, Alexei I. Ekimov, the 2023 Nobel laureate in Chemistry, published his Nobel-winning paper in the *Journal of Experimental and Theoretical Physics* in 1981 while working at the S.I. Vavilov State Optical Institute. Since 1999, he has lived and worked in the United States.

Thus, the problem lies not in planning itself but in the ideological absolutisation of the planning method. Scientists, while outwardly complying with the planned ideology, continued to pursue research they found *personally interesting*. The state, in turn, settled for a simulacrum of a 'planned economy' where the plan (the signifier)

became detached from the realities of scientific work (the signified) and turned into a symbol of a special kind, one that had lost its meaning. Soviet leaders, 'expecting scientists to justify their authority... received its denial from them every day, albeit wrapped in a loyal veneer' (Aksenov, 1999, p. 234). In other words, the internal compensatory processes of self-organisation within the scientific community proved effective over a relatively long timescale.

Any attempts to 'manage' fundamental science based on ideological and purely utilitarian grounds are ineffective. Yet, centralised directive planning was introduced precisely as a mechanism to ensure the controllability of scientific development. Paradoxically, directive planning of fundamental science in the USSR became a factor in reducing not only its efficiency but also its diversity. Major and critically important fields of science were eliminated in the USSR before 1960: genetics, sociology, psychology, cosmology, and cybernetics (though partial restoration occurred later). The replacements that emerged proved to be unviable phantoms.

Notably, today, 100 years later, we are once again encountering similar discourses in public policy. Calls to prioritise applied research at the expense of fundamental research are resurfacing, ignoring the dangers of creating structural imbalances. We still struggle to address the challenges of translating fundamental research results into applied developments and their technical implementation. Finally, planning and control, armed with scientometric indicators, continue to hollow out the essence of scientific research activity.

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